Governor's Task Force on Science, Technology, Engineering and Math Education (STEM)

Monday August 25, 2014

Manchester Community College, Manchester, NH

Task Force Members in Attendance:	Ross Gittell, Chairman; Brian Blake; Barbara Couch; Susan D'Agostino; Mary Kate Hartwell, Joseph Helble; Caroline Herold; Robert Hallowell; Todd Lamarque and Palligarnai Vasudevan.
Unable to Attend:	Joyce Craig, Jeremy Hitchcock; Dean Kamen; Paul Leather
Others present:	Molly Connors, Governor's representative; Cynthia Dunlap, Professional Development Chair, Kathleen McClaskey, Advocacy Chair, the New Hampshire Society for Technology in Education (NHSTE); Lauren E. Provost, PhD, Department of Education, University of New Hampshire; Jane Bergeran, Education Consultant, Southeastern Regional Education Service Center

I. Call to order

Chairman Gittell opened the meeting at 4:00 p.m. by welcoming members of the Task Force and the public who were present at the meeting.

II. Approval of August 13, 2014 minutes

Robert Hallowell made a motion to accept the minutes. Dr. Brian Blake seconded. The minutes were approved unanimously.

III. Items requiring discussion

a. Overview for next phase of the Task Force recommendations development. Chairman Gittell reviewed the work plan and timeline with Task Force, noting that the Governor would be asked to preview recommendations before proceeding to the final report. The Taskforce will attend this review, date to be determined. (see Addendum A: work plan and timeline attached)

b. New Task Force groups, formed to work on the next phase of recommendations, met to discuss next steps. (See Addendum B: Round 2 Recommendations and Group Assignments). In addition, Dr. Susan D'Agostino was asked to lead the development of STEM definitions for education and skills to be used in the final report to the Governor. Dr. D'Agostino asked for volunteers to work on the definitions. Barbara Couch and Todd Lamarque volunteered. Chair also reminded the Task Force to address ideas on "parking lot" list. (See Addendum C).

c. The next meeting of the Task Force is scheduled for Sep 16 from 4 -7 pm. Location to be determined.

IV. Public input:

a. Ms. Cynthia Dunlap, Chair, Professional Development, New Hampshire Society for Technology in Education (NHSTE) spoke on behalf of Dr. Provost, Ms. Bergeran and Ms. McClaskey. She said that NHSTE would provide input on the STEM definitions and would also continue to work on aligning current NHSTE STEM efforts with the proposed Task Force recommendations.

ADDENDUM A

GOVERNOR'S TASK FORCE ON STEM EDUCATION WORKPLAN AND TIMELINE

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Overview:

This next phase of work moves us from early stage recommendations through to a final draft for the Governor's preliminary review prior to writing the final report. We now move to new small groups to address each of the 8 recommendations which emerged from the August 13, 2014 meeting (as a result of combining similar recommendations)[1]

Each group has a lead author to guide and facilitate the next phase of work. See *Task Force Round 2 Recommendations and Group Assignments (attached)*

We have prepared the following to guide your efforts. We welcome your suggestions for improving this.

ELEMENTS TO INCLUDE:

As we go forward, here is a suggested format for your final recommendations.

- Recommended actions, benchmarks and timelines (see example from MD Task Force excerpt attached)
- List actors, expectations and roles they will need to play. Consider: teachers, students, parents, administrators in K-12; school boards, post-secondary educators and administrators, the NH legislature, business/industry, professional and nonprofit organizations and the NH general public
- Revised or reaffirmed items from the initial recommendation such as (a) problem statement (b) goals (c) success metrics, (c) challenges (d) opportunities
- Other factors that you think should be considered when reviewing the recommendation

TIMELINE AND MEETING SCHEDULE

August 25	4-6 pm MCC Room 272 – new groups meet to plan work and assignments
September 16	Groups exchange work prior to meeting and discuss at meeting; everything covered?
September 25	Draft recommendations are reviewed for comments and revisions
October 7	Final review prior to presenting to Governor for preliminary review for questions, clarifications and suggestions
October 14	Review and discussion of report outline (distributed prior to meeting); additional writing

[1] The recommendation to create a NGSS/STEM coordinator in the Department of Education was tabled pending development of the other recommendations.

	assignments (volunteer)
October 21	Report draft reviewed and revisions suggested; professional editing and proofing Completed before next review
October 30	Optional: reserved in case above schedule is delayed or additional review needed
November 4	Final report reviewed and approved
November 10	Reserved if needed for unexpected delays
November 14	Report is submitted to the Governor

ADDENDUM B

Task Force Round 2 Recommendations and Group Assignments

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GROUP 1: C-CUBED

COMBINED**:** TEAM A1 C-CUBED-CHALLENGES, COMPETITIONS AND CAPSTONES/ Include Elements of TEAM C1 ENGINEERING&TECH CURRICULA

TEAM A1 C-CUBED-CHALLENGES, COMPETITIONS AND CAPSTONES

Creates curriculum pathways beginning in 3rd grade to offer students a rotating series of different learning opportunities beginning with a "challenge" (thematic project which integrates STEM topics), "competition" (which encourages collaborative team work on STEM-related district wide competitions), and a "capstone" project (which requires research, development and presentation of original work in STEM).

TEAM C1 ENGINEERING&TECH CURRICULA

Recognizing the ubiquitous role of technology and engineering design thinking in 21century careers, recommends no "one size fits all" curricula for engineering and technology but rather the creation of a broad set of options including focus on experimental, self-discovery opportunities such as FIRST robotics, biological science

Work groups: JOE (LEAD), DEAN, JOYCE, BRIAN
Discussion and Next Steps: The new committee discussed the most effective method to merge the two recommendations (above) and determined to assign responsibilities to individual members.

- Draft merged description for recommendation; merged actions, benchmarks and identification of overlaps, if any.
- Merge problem statements and goals; identify areas of alignment to Next Generation Science standards
- Develop proposals to address issues of enhanced inclusion of girls in STEM
- Initial draft will be shared with other members for review before proceeding to next steps
- Proposed deadlines: Sept 3 and Sept 10

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GROUP 2: NH STEM EARLY COLLEGE ACADEMIES OF EXCELLENCE

FORMERLY: TEAM A2 NH STEM CENTERS OF EXCELLENCE

TEAM A2 NH STEM CENTERS OF EXCELLENCE

Create a network of STEM Centers of Excellence for students who have a special interest and talent in STEM subjects. (1)New Hampshire Math and Science Academy and (2) New Hampshire CTE /STEM Early College Academies. Both schools will conduct STEM statewide outreach to K-12 students through activities including extracurricular, co-curricular and summer programs, and teacher professional development in STEM

Workgroups: SUSAN (LEAD), BARBARA, JEREMY

Discussions and Next Steps:

- The group decided to focus outreach for Early College Academies of Excellence to grades 6-12 (from a previous focus on K-12) to avoid over reaching and spreading efforts too thinly.
- Since "pathways" recommendation is now its own plan, Group 2 will remove this from their recommendation.
- Determined the need to more clearly define "critical mass" of students to recruit to earn 12 or more college credits, a certificate or associate's degree through these Early College Academies.

Career/Technical Education Academies

- Determined the need to specify more math and science teachers in Career and Technical Education (CTE)/Early College Academies (currently too few involved in CTE)
- Focus for CTE on offering studies to minimize transportation to offsite locations (as is currently the practice – incurring time loss and expense) and to also focus on contextualizing the learning in CTE studies.
- Need to clarify how an existing CTE might be transformed into a CTE-ECA. Need to identify specific goals concerning the number of CTE centers that might undergo this transformation and any other details (such as geographic region) that might be relevant to decisions.

Math and Science Academy

- Formulate a long term vision and plan which can be rapidly deployed but monitored and grown based on evidence gathered.
- Next Steps: formulate plans for review before September 16. Group meeting dates to be determined.

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GROUP 3: STEM SUPPORT NETWORK
TEAM A3 STEPS / TEAM B3 STEMCENTERS, AMBASSADORS&CHAMPIONS

TEAM A3 STEPS (STUDENTS, TEACHERS, EMPLOYERS, PARENTS AND SCIENTISTS)

Creates a *NH Innovation Lab* to organize and house various STEM activities including (1) a mobile (traveling) STEM science center to reach all districts of NH, especially rural districts; (2) a business-educational-scientific professional collaboration to suggest methods to effectively integrate STEM curriculum into math and ELA (mandatory subjects in K-8), provide speakers and mentors in schools, externships for students and teachers, develop activities to engage and inform parents about STEM opportunities for their children.

TEAM B3 STEM CENTERS (HUBS), AMBASSADORS&CHAMPIONS

Regional STEM hubs offer teachers the ability to become part of a larger Professional Learning Community and enhance professional practices. Teachers and administrators can connect with other schools, and *particularly businesses*, that can offer assistance in and out of the classroom, through technology, training and resources; Centers would house space for students to tinker and explore (similar to UNH Discovery Lab), and store STEM teaching materials (STEM packs) for use by K-6 teachers (who often lack math and science training).

Workgroups: MARY KATE (LEAD), BOB, TODD

Discussion and Next Steps:

- Determine the scope and depth of the proposed STEM support network. This includes a decision on major focus. Is this Network to be primarily focused to support teachers with professional development? Will it include elements of "STEPS" which positioned the STEM outreach as resources to support teachers in their classroom activities?
- Next Steps: Develop appropriate language to merge recommendations; merge problem statements, goals and create suggested actions and benchmarks before Sep 16. Group to determine schedule for interim meetings.

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GROUP 4: CURRICULUM INTEGRATION
TEAM A4 iSTEM / TEAM B2 CURRICULUM INTEGRATION

TEAM A4 iSTEM (INTEGRATED STEM IN THE CLASSROOM**)**

Brings together disparate concepts including: (a) creation of STEM labs (as opposed to science labs) where students can "tinker" with engineering items for individual discovery and creative time; (b) hiring STEM specialists who rotate among schools (similar to Arts, Music specialists); (b) creating STEM learning opportunities by utilizing respected K-12 educational programs such First robotics, Intel science, Project Lead the Way; (c) creating STEM time within math and ELA teaching; (d) scheduling professionals in science and technology to visit schools.

B2: CURRICULUM INTEGRATION

Recommends a coordinated and collaborative effort for teachers in STEM: (a) Designate a "Year of STEM" to focus academic, business and community efforts in support of building statewide shared STEM learning resource curriculum and activities; (b) Establish positions as STEM "master" teachers who can serve as navigators, especially in K-5 and Middle schools, to help integrate STEM into math, English Language Arts and Arts curriculum, and to mentor teachers in creating applied and integrated STEM learning opportunities for students (c) Promote teaching of project-based learning in STEM through authentic problems, exposure to multidisplinary subjects, working in teams, reflecting on the process of problem-solving and building real artifacts and (d) Develop or adapt "best practice" models of K-12 STEM curricula (especially integration of STEM academic and CTE education) and make readily accessible to educators via a digital commons or other collective, collaborative resources

Workgroups: BOB (LEAD), ROSS, TODD, and JOE
Discussions and Next Steps:
Merged the problem statement drawing from the two initial recommendations (described above)

- Support the "day to day" application of science and math in pre-high school education.
- Goal should be applied STEM every day in different ways for young NH learners. This would involve applying math and core sciences using technology and engineering principles and concepts in classroom instruction and project based learning.
- The technology and engineering is the "TiE" that makes STEM relevant and exciting particularly for the younger students who are not inclined to learn math and science as theory or by rote.

Draft solution statement: Student should be provided the opportunity to explore new topics in STEM every day. The TF recognizes that a strong foundation in math and science is necessary but not sufficient for students to excel in Technology and Engineering. Our recommendation here is meant to "elevate our game" in STEM across the state, and not simply check off the science box as STEM.

Next Steps: Before Sep 16 meeting, Group will meet to further refine recommendation, add benchmarks, metrics and key actors necessary for successful implementation.

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GROUP 5: PATHWAYS

FORMERLY: TEAM A5 PATHWAYS FOR STUDENTS

> TEAM A5 PATHWAYS FOR STUDENTS: Pathways to successful careers are made available to all students, college bound and not. Recommends preparation of school guidance counselors, mentors and other to guide students with introduction to career options and proposes to create a ladder of career exposure suitable for each grade level beginning in G6. Every student should have an individualized pathway plan (IPP) that guides the student throughout their educational experience.

Workgroups: BARBARA (LEAD), ROSS, JEREMY, JOYCE

Discussion and Next Steps

- Discussed the scope of individualize learning plans. Suggestions included focusing on 100% of students in grades 7 and 9 – years 7-12 (students with IEPs will satisfy this recommendation).
- Will begin work on defining an ILP (also known as Personal Learning Plan) which may include: interest inventories, systems for providing career information and advising.
- Proposed that middle school students participate in job shadowing and career exploration experiences
- Dual credit environments (such as CTEs) will early at least 12 college credits (today the majority of students in CTE early less than 12 credits –the threshold needed for career readiness and encouraging students to pursue further education).
- Success metrics included following suggestions
    - Doubling the number of students entering STEM fields after graduation from college/community college or certificate program
    - Number of employers involved in helping to create pathway program
    - Percent of employers who are satisfied with graduates who have participated in a pathways program
- Role of key actors to make Pathways successful:
    - Mentors from local communities where students are enrolled
    - Parental involvement
    - Internship and apprentice opportunities (which fit individualized learning plans)
    - Opportunities to job shadow (provided by the business community
    - School counselors, teachers and administrators
- Next Steps: Group plans to schedule meetings to work on formulating the recommendation in more detail

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GROUP 6: TEACHER PREPARATION AND PROFESSIONAL DEVELOPMENT

FORMERLY: TEAM B1 AND C4: TEACHER PREPARATION AND PD

TEAM B1 TEACHER PREP AND PD

Recommends providing pre-service and in-service professional development in STEM content and pedagogy, especially for K-6 early education teachers through tuition incentives; implementing math specialist positions (approved by NH DoE) who might also serve STEM specialist positions; offer "Elementary STEM Teacher" endorsements through Bureau of Credentialing, integrate STEM training for all K-6 elementary teacher preparation programs and establish professional development for certified teachers to become "STEM Leaders."

TEAM C4 TEACHER PREP AND PD

Recommends teacher preparation programs for elementary education to increase the requirements for the teaching of science (in particular) and the use of scientific inquiry as a component of lesson planning. Also recommends annual "boot camp" type professional development opportunities for teachers at the elementary level to bolster their comfort with teaching science by modeling lessons and giving teachers feedback on their own lessons.

Workgroups: CAROLINE (LEAD), VASU, PAUL and BRIAN TO consult

Discussions and Next Steps:

Group discussed commonalities between two recommendations. Noted need to focus on teachers in K-6 early childhood education who do not have math or science training but are asked to teach STEM subjects.

- Agreed that the focus on teacher training and professional development should encourage "real world" exposure by offering opportunities for teachers to work on technology, manufacturing and scientific projects through internships rather than classroom work only.
- Will review teacher preparation currently to suggest approach STEM requirements
- Reviewing new approaches to credentialing including STEM certificates, micro-credentialing and STEM-specific courses
- Next Steps: Merge problem and solution statements from two original recommendations, and prepare additional information including success benchmarks and key actors/actions needed to implement this recommendation successfully.

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GROUP 7: MATH CURRICULA PATHWAYS
FORMERLY TEAM C2 MATHEMATICS CURRICULA

TEAM C2 MATHEMATICS CURRICULA

Recommends "coding" course as a foundational course in K-12 to build logical and analytical skills. Three pathways to fulfill math requirements are recommended to create flexibility geared to student interest but all three pathways prepare students for college. Path #1 includes calculus (following algebra, geometry, trigonometry, coordinate geometry and possibly statistics) particularly useful for careers in physical sciences and engineering; Path #2 focus toward statistical thinking including data science and data visualization suitable for many careers including business, analytics, biological science, health sciences, engineering and computer science; Path #3 focuses on linear algebra (algebra and geometry) which is also suitable for many careers including math, computer science and engineering.

Workgroups: VASU (LEAD), CAROLINE, MARY KATE

Discussion and Next Steps:

- Determined to continue to develop the multiple math curricula options
- Need to examine in more detail the State Task Force on Math instruction recommendations
- Determine course recommendations such as mathematical modeling, statistics, data analysis, etc.
- Determine the appropriate assessment tools and measurements such as international assessment standards (to prepare NH students for global career readiness)

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GROUP 8: NEXT GEN SCIENCE STANDARDS integrating E&T

TEAM C3 NEXT GEN SCIENCE STANDARDS

TEAM C3 NEXT GEN SCIENCE STANDARDS

Adopt Next Generation Science Standards (NGSS) to replace NH current standards that were adopted in 2006. NGSS incorporates practices, crosscutting concepts and core ideas include Science, Math, and Language Arts; Standards are written as performance expectations which are NGSS requires students to analyze, argue, construct, design, and develop, which are all characteristic of 21st Century skills

Additional reference for E&T
TEAM C1 ENGINEERING&TECH CURRICULA

Recognizing the ubiquitous role of technology and engineering design thinking in 21century careers, recommends no "one size fits all" curricula for engineering and technology but rather the creation of a broad set of options including focus on experimental, self-discovery opportunities such as FIRST robotics, biological science

Workgroups: BRIAN (LEAD), PAUL

Discussions and Next Steps:

The team agrees to recommend the adoption of the Next Generation Science Standards to replace the current NH standards for science that were adopted in 2006. NGSS incorporates practices, cross cutting concepts, and core ideas including science, math and language arts. The NGSS Standards are written to require students to analyze, argue, construct, design, and develop, which are all characteristics of 21st century skills.

Reasoning: The old standards are too broad and unfocused. The NGSS gives teachers, particularly elementary teachers greater understanding of where to focus their PD and lesson planning. Adoption will provide an assurance that important learning is being taught consistently across the state. This will also help with the issue of student transience. The NGSS is built as a STEM standard, as it addresses the areas of technology, engineering, and Math. There is no need to adopt a separate set of STEM standards.

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ADDENDUM C

PARKING LOT: FOR IDEAS TO CONSIDER AND/OR INCLUDE IN FINAL RECOMMENDATIONS

(From August 13, 2014 Task Force meeting)

1. Girls in STEM

2. Rural students (lacking easy access to resources)

3. Administrative structure to oversee implementation and accountability for STEM recommendations

4. Home schooled students

5. STEM online courses such as Virtual Learning Academy Charter School (Exeter, NH)

6. Inclusion of international assessment standards in the mix

7. Inclusion of the Arts

8. Inclusion of professional school counselors and college admissions directors

9. Consider incentives to encourage STEM mastery for teachers

10. Include consideration of expectations of each group to be impacted and/or tasked with implementation of a taskforce STEM recommendation

11. Consider establishing STEM coordinator in DoE (charged with implementing STEM recommendations) to ensure a cohesive set of responsibilities; consider separating oversight for Common Core English Language Arts/Math and science/Next Generation Science Standards